THE OPTICAL MAGIC LANTERN JOURNAL
AND PHOTOGRAPHIC ENLARGER
EDITED BY J. HAY TAYLOR
A MAGAZINE OF POPULAR SCIENCE FOR THE LECTURE-ROOM AND THE DOMESTIC CIRCLE
Entered at Stationers' Hall
1889

WITH WHICH IS INCORPORATED THE "LANTERN WORLD."

Vol. 10.—No. 120. MAY, 1899. *Price* 2d., *Post-free* 3d.

CONTENTS.

	PAGE
Notes	57
A Convenient Lantern Slide Box	59
About Animated Photography	59
Lantern Mnemonics.—No. II.	60
An Interesting Experiment with the Lantern	61
Shadowgram or Silhouette Slides for the Optical Lantern	63
Physics for Lanternists.—No. III.	64
The Dark-room Window with a Modification	65
Directions for taking Photographs in Natural Colours	67
Patent Intelligence	67
Notes and Queries	68

NOTICES.

THE *Optical Magic Lantern Journal and Photographic Enlarger* is issued on the 1st of every month, price Two Pence, and may be obtained from all Newsvendors, Railway News Stalls, Photographic Dealers, or from the Publishers, at the following rates, post free:—

12 months, 3/-. United States, 75 cents.

EXCHANGE Column, General Wants, &c. (not Trade)—First 20 words, 6d.; and for every 3 additional words, 1d.

SMALL ADVERTISEMENTS must reach the office not later than the first post on the 24th of each month. All cheques and postal orders to be made payable to the Magic Lantern Journal Company, Limited.

EDITORIAL communications must be addressed, **J. HAY TAYLOR.** Advertisements and business communications to **THE MAGIC LANTERN JOURNAL COMPANY, Limited, 9, Carthusian Street, London, E.C.**

American Agents:—The International News Co., 83 and 85, Duane Street, New York City.

NOTES.

The Lantern in Church in Australia.—We append an extract from an article written by the Rev. W. A. Bainger for the *Christian Weekly* published in Australia. He says:—"To many of our people the lantern and the proposal to use the lantern might be distasteful as it is novel, but I fail to see why it should not be devoted to the highest purpose the same as the piano. For a long time my church had more pews than people. I feared it might be difficult to keep order in the dark, might also be a lack of reverence, but the results—the church was crowded, and remained so at all the services. The order was almost perfect, and I have constantly received testimonials of help and blessings received."

◆ ◆ ◆

Cinematograph and Cycling Clubs.—The *Bicycling News* suggests that the cinematograph shows ought to be popular with cycling clubs, and should take the place of the now forgotten lantern social. Some exciting cycling scenes could be "worked," and a good exhibition would arouse a lot of interest even amongst the *blasé* clubmen of to-day.

Overheard at a Class-room.—Professor, lecturing: "Oxygen, gentlemen, is essential to all animal existence. There could be no life without it. Strange to say, it was not discovered until a century ago, when——" Student: "What did they do before it was discovered, sir?"

◆ ◆ ◆

A Kirby Lantern Lecture.—Those who attended a lantern lecture lately announced at Kirby were greatly disappointed to hear it stated from the platform that the illustrations would have to be omitted as the lantern was found to be "out of working order." This indicates bad management somewhere.

◆ ◆ ◆

Removal.—Mr. Fred V. A. Lloyd, late of 5, St. John Street, Liverpool, has, within the past few days, removed to 15, Lord Street, which is a few minutes' walk from the old premises.

◆ ◆ ◆

"Picture Taking and Making."—This is the title of a neat and well printed book issued by Kodak, Limited, at 2s. It gives concise yet full instructions in the various manipulations necessary for the production of pictures.

◆ ◆ ◆

Kodak Film in Spectroscopic Photography.—Sir Norman Lockyer has lately been successfully experimenting with flexible film, with the idea of adapting it to spectroscopic photography. The large concave Rowland grating, which Sir Norman Lockyer is now using for his solar spectroscopic photographs, has 20,000 lines to the inch ruled on its surface, and is of 21½ feet radius, giving a spectrum of 30 inches long. The focal plane of this grating is of necessity considerably curved; in fact, the plane of accurate definition at the edges of the field is about 0·5 inches in front of the similar plane at the centre. It, is, therefore, impossible to get a sharp photograph of the whole spectrum on a glass plate; in fact, not more than 18 to 20 inches of the spectrum can be brought into focus on the same plane, but this difficulty was got over by the use of a Kodak film, which was bent to the curvature of the field. The Kodak Company have sent us a print of one of Sir Norman's photographs taken with this Rowland concave grating. This must be the longest solar spectrum photographed at a single operation. It is 30 inches long, and shows the arc spectrum of iron with a comparison spectrum of the sun from wave length 3,600 to 5,200. Sir Norman Lockyer also hopes that by using films instead of glass plates at the next solar eclipse, he will be able to obtain a greatly increased number of photographs, owing to the rapidity with which the film can be shifted in the short space of time available for photographic operations. At the last eclipse the photographic work was concentrated on obtaining a series of photographs of the chromosphere, both about the time of beginning and end of totality. By careful drill Mr. Fowler and Dr. W. J. S. Lockyer were both able to secure 10 photographs at each of these important periods, the time occupied in making each series of 10 exposures being 12 seconds. An apparatus for carrying films is also being designed which can be adapted to the spectroscopic cameras at present in use in the laboratory and observatory.

◆ ◆ ◆

Ashton-under-Lyne.—On the 2nd inst. the Ashton-under-Lyne Photographic Society are to have a specially interesting and instructive meeting. Members are requested to bring their plates, exposed on the April 29th ramble, with particulars of exposures, stop, etc., when they will be developed by different processes.

◆ ◆ ◆

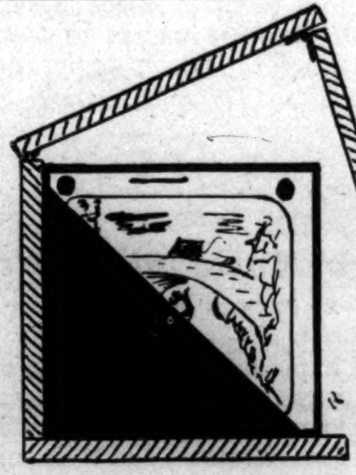
Acetylene at Liverpool.—The Fowler Acetylene Gas Company have lately completed an installation of 100 lights at the Clifton Hotel, Liverpool. The generator is situated at the rear of the hotel and is under the charge of the "boots," who re-charges the generator daily.

◆ ◆ ◆

Wave Phenomena.—The members of the Royal Geographical Society recently had an interesting lecture by Mr. Vaughan Cornish, entitled "Illustrations of Wave Phenomena." A great number of lantern slides and films were used to explain the mounting-up of a swell on entering shallow water, with steepening front and flattening of the back, the gradual diminution in size of waves in approaching a gently sloping shore, the network pattern of the foam, and the foam bridges between pairs of whirlpools of dark water like the bright bridges of sun-spots. The crossing of different sets of waves, giving dark, sharp-pointed wedges or flashing mirrors of light, according to the position of the sun, was shown, and the placid surface of a lake on a calm day was seen to be rising and falling in swells when illuminated by the slanting rays of the setting sun which brought out the low relief.

A Convenient Lantern Slide Box.

THOSE lanternists who have inspected the gramaphone and the style of box issued with same for the safe-keeping of the thin discs or records will, at least now that their attention has been called to the matter, notice that the style of make of the latter suggests itself as a very convenient box for lantern slides if made of the required dimensions.



We give a sectional sketch of the manner of hinging the top and front, from which it will be seen that when opened, the top will fall at right angles to the back, and the front of box will hinge over on this, thus leaving two sides of the slides exposed so as to be readily get-at-able. The divisions between the slides or batches of slides are made diagonally, as shown in the black portion in the sketch.

For the safe transit of slides it is a matter of little difficulty to fasten a small strip of rubber tubing to the insides of the box, thus ensuring a cushion which will prevent breakage should the box be roughly handled.

It may occur to the maker that the diagonal divisions, instead of being inserted between each slide, would be better if spaced to hold batches, say, of four or six slides; the material of which these divisions can be constructed may, if space is any object, be made of zinc.

A box of this nature is so simple to make that no instructions need here be given. Some years ago a box was issued by some firm or other in which the front hinged down, but we think the one described is perferable, and that those who happen to possess such a box would find it an advantage to hinge the front to the top of the lid as described.

About Animated Photography.

Continued from page 53.

AS to the reducing agent to be used, that must depend upon the particular predilections of the operator. Some workers advocate pyro either with ammonia or soda, while others place their reliance in hydroquinone or metol. In using either of the latter special care must be taken both against staining by oxidisation of the solution of the film, and against light action after development and before the sensitive salt is entirely removed by fixation.

The printing of the positive to be exhibited from the negative taken in the camera is an operation that requires considerable care. A special printing machine must be used, for it will be seen that a printing frame 80 feet long is impracticable. Printing is accomplished by contact, but it is done a bit at the time by drawing both negative and sensitive film together across an aperture through which the necessary light reaches them. A simple mechanical contrivance is employed to draw the two across the field of action, and care should be taken to run it at uniform speed, or one portion of the positive will receive more exposure than another. In the best forms of

printing apparatus

a different series of sprocket wheel is employed to actuate the negative to that which has to draw along the sensitive film. When both traverse a single sprocket wheel whose teeth project through the perforations in each, there is a tendency for one to drag slightly behind the other and faulty registration commonly results. When it is remembered that "Registration"—the falling of one picture on the screen exactly in the place before occupied by its immediate precursor—is that factor upon which the steadiness, or otherwise, of the animated photograph entirely depends, its great importance will be recognised. A badly designed camera will probably yield a negative of irregular registration. From such a negative it is impossible to produce a positive that will give a steady result upon the screen. But it is very possible, indeed, easy to make an unsteady print from a negative that is perfect in this respect, and that is why such great care should be observed in the printing operation, and in regard to all the apparatus concerned therein. The perforation of the film, too, is another item which in this connection may mean success or failure. Although all may claim to be "Standard Edison Gauge," the perforations in the films turned out by different makers vary considerably in the distance between the holes. It is easy to see that a slight irregularity in this respect between negative and positive might lead to great difficulties in the printing process, more especially as it is quite a common custom to procure negative film from one maker while that for the positive emanates from another firm. For this reason it is highly desirable for each operator to perforate his own films, and so long as he uses a good perforator and sticks to it for his films he cannot well go wrong. The difference in price between perforated and unperforated sensitive films will soon cover the cost of the apparatus.

As regards development of the positive, the same remarks apply, with the reminder that special care must be used in making a lantern transparency that it is above all things really transparent, and it should be free from stains and of a pleasing colour. Developer suitable for lantern slide work should be used, and care taken that the operation is only carried far enough to give just sufficient density and no further. Remember that a very little density will go a long way in a cinematograph film as in a lantern slide—a point which many producers are apt to overlook—and that the high light should be absolutely clear film with

no deposits

whatever upon it. And if you use the ferrous-oxalate developer, and it is an excellent one, do not on any account omit the acid bath before attempting to wash the film after development.

Reference has been made to the Standard Edison gauge in respect to the sizes and perforations in cinematograph films, and it may be as well to point out what this means, and how it differs from other gauges which are sometimes met with. Edison films are based upon those which were supplied with the old Edison kinetoscope. They are $1\frac{1}{2}$ inches wide, of which the picture occupies 1 inch. Along either side of the strip of celluloid there is a row of cushion-shaped holes, about $\frac{1}{16}$ inch across, and at such a distance apart that four of them on either side go to one picture. The pictures are $\frac{3}{4}$ inch high. Other gauges vary slightly from this in that the holes are to a very small and generally negligible extent, either larger or smaller, while they are often square instead of cushion shaped, and while there are always four holes to the picture, that picture varies appreciably in height. For this reason—variations in height of the picture meaning a difference in the separation of the holes—there is often a difficulty in fitting certain films on a given sprocket wheel. More especially is this the case where the sprocket wheel is large or there is more than one to a machine. When there is only one small toothed wheel it is rarely that a film has such extraordinary perforations that it will not fit. But the "Lumière" perforations used in the well-known Lumière machine are quite different. In this case, while the pictures are the same size, there is only one hole on each side to each picture. The holes are opposite one another on either side of the film, and they are round, and measure about 2 millimetres across. Lumière films cannot be used on any machine made for Edison perforations, and *vice versâ*.

Lantern Mnemonics.—No. II.

By JACK-O'-LANTERN.

IT happens every day, in a variety of ways, that the power of retaining knowledge in the mind is worth consideration, and it should not be thought unorthodox to establish some system of one's own if needs be, whereby the wonders of memory can be made useful. By picking up a shell from the bric-a-brac bracket, some dried grass from a vase, or a photographic slide, recalls to mind momentarily incidents of a tour, sights, scenes, facts that now all but lie dormant. So yesterday whilst reading in the morning paper of the wonders of the giant telescope that will play so important a part at the Paris Exposition of next year, that is to bring the moon quite close to us and so forth, information that seemed familiar, so the memory flashes back some seven years, when many of us read in the OPTICAL MAGIC LANTERN JOURNAL for October, 1892, the perspective of the scientific instrument now nearing completion. This, it is believed, was the first journal that promised as it were a lantern slide of so big an achievement.

Lanternists who use film slides, and we all do more or less, should remember that they can be kept flat by mounting them between a couple of cover glasses.

In showing animated pictures it may be borne in mind that the water trough, or alum trough as is sometimes used, may be dispensed with by substituting a piece of heat resisting glass, which is of German manufacture. This is placed in front of the condenser, but obstructs a large percentage of the light rays. Should, however, an alum trough be used, it is well to throw the solution away directly it is finished with, because inadvertently it has been used from a jug, into which it has been poured, to water a certain stimulant, and which proved anything but refreshing to him whom it was intended to refresh.

Whilst on the cinematographic subjects, it is of the utmost importance to keep well posted in the rules and regulations that govern such performances, issued from time to time by the London and other County Councils. Amateurs, who possibly just give an occasional show, will be apt to overlook this, but that the restrictions are frequently being altered most readers are aware, by the drafts of alterations that occasionally appear in the pages of this journal, which, if cut out and pocketed, helps in a marked degree to impress us.

"What light shall I use," says the novice, "Amongst the many specially recommended; I want the best I can get for my money." That is so, the factor of cost is the first thought, and quite right it should be so. But this from a professional standpoint matters little. For the production of any one of the

popular luminants

in daily use costs but a trifle more or less, as the case may be, one from the other. Remember the two lights of highest intensity, electric light not included, are the oxyhydrogen mixed jets or the oxy-etho. By the latter, of course, the ether saturator is inferred. Next in order, the blow-through form of jet with its credential of absolute safety. The acetylene light is also considered by some to compare with the blow-through. The oxy-calcium, one of the first forms of limelight, is also good and simple.

Speaking of lights reminds one that in close proximity to it is the condenser, which must fit in its mounts loosely, because when the brass is heated it expands much more than the lens, and being thin rapidly cools down. This sudden contraction frequently costs the lanternist a new condenser. "Why should I trouble to remember such as that?" says some one, "knowing as I do the lens was quite free when I bought it," for the very simple reason that it is presumed you sometimes clean your lenses, and in so doing may not place them in the exact position as before, or replace the screwed flange to its required depth by a fractional part of the thread. Never forget to try the shake of the condenser, especially when cleaning.

It is worth the lanternist's while, if he goes in for slide making, to remember that the most beautiful results are obtained by the collodio-bromide process, and those who have studied wet plate photography can fully testify to the accuracy of this assertion. Some of us also make a practice at least once a year, when the weather is at its best, to divert from the monotony of the dry-plate to sniff the collodion bottle, and slides produced in this way, known as the old wet process, give delicate and satisfactory results.

Never forget there are certain restrictions issued by the railway companies for the conveyance of compressed gases. These may be had for the asking at any of the termini.

Be it borne in mind in arranging the descriptive matter for a lecture with lantern views, that though much may be written, it is the worst possible fault to bore your hearers with much. All information respecting scenes visited should be boiled down to the smallest compass. Verbosity and pithy diction should be aimed at, so that at the close of the entertainment the universal opinion may read "we could have done with a bit more."

There are times when a lantern slide after much using requires rebinding, and plain photos can often be greatly improved by thinking of the tinted cover glasses, obtainable at any dealers. Sunlight, moonlight, sunrise, sunset, water, and many other effects, are worth noting.

In placing rubber tubing, do so in a way that no harm can come to it either by kicks, being trodden upon and so forth; also bear in mind that the tube with a coiled wire lining is bad for lantern purposes, and if pressure be brought upon it, such as treading, it does not recover its shape in consequence of the coiled lining being flattened or otherwise damaged.

(*To be continued.*)

An Interesting Experiment with the Lantern.

By MAGNET.

THE following is a description of a piece of apparatus used for illustrating phase differences, and forms part of a paper read before the Society of Arts, Boston, by Louis Derr, M.A. The apparatus depends upon the principle that when an electric current is sent through a wire lying perpendicularly across a magnetic field, a force is developed which urges the wire at right angles to both the direction of the field and the current. A powerful electro-magnet is mounted on an upright stone base, and a wire is stretched across the field between its poles. At the top of the apparatus the wire terminates in the free end of a light metallic hinge, to which a small mirror is cemented. The to and from vibrations of the wire may be observed by a beam of light from a lantern reflected from the mirror to a screen, the hinge preventing all lateral motion and twisting. The other end of the wire carries a timing-pin and a device providing a slight angular motion of the whole wire for adjusting the mirror.

An alternating current sent through the wire urges it alternately backward and forward, and if the timing-pin is timed until the period of free vibration of the wire coincides with that of the current, the wire springs into vigorous and distinctly audible vibration, and the spot of light reflected from the mirror on the screen elongates into a vertical line.

That this line is traced by the moving spot is easily shown by putting in the path of the reflected beam a mirror revolving about a vertical axis, and thence reflecting to the screen. On turning the second mirror the successive positions of the spot fall in verticals, and the result on the screen is a very perfect *sine* curve, a faithful representation of the vibration of the wire. Fig. I. shows the arrangement of mirrors, using two wires.

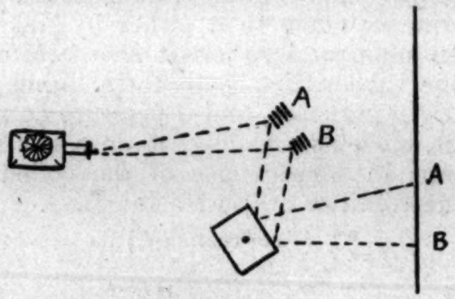


Fig. I.

With two such wires the observation of the phase difference between two currents is easily made. With everything at rest, the mirrors are adjusted until the spots of light reflected on the screen are coincident. If now the wires are connected into separate circuits carrying currents, the lines of light on the screen remain superposed, the one corresponding to the stronger current appearing slightly longer than the other. On turning the revolving mirror, any phase difference between the currents is at once shown by the horizontal displacement of the lagging curve past the other, exactly as text-book diagrams of such curves are drawn.

To observe phase differences between voltage and current under various conditions, one wire is connected to the terminals of the given circuit through a suitable non-inductive resistance. The resulting current will then be sensibly in phase with the applied electro-motive force, and the curve on the screen may be taken as representing the changes of the electro-motive force itself. The other wire, shunted if necessary, carries the current to be studied. One of the curves on the screen may be coloured and thus identified by putting a slip of coloured glass in front of the corresponding mirror. The phase relations between voltage and current in circuits of different character may be conveniently compared by using a three-point switch and connections, as shown in Fig. II., where L represents an impendance coil, R a non inductive resistance, and C a condenser. The circuits can thus be interchanged as rapidly as desired, and the instant shifting of the curves on the screen, corresponding to the character of the circuit employed, and agreeing with the conclusions of a preceding paragraph, is quite striking. With the apparatus here shown, a current of one ampere in the wire and a total length of about 30 feet in the reflected beam gives curves on the screen of 2 feet amplitude.

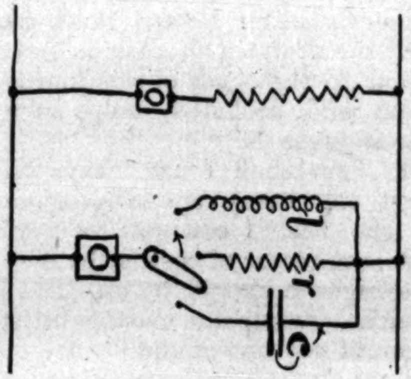


Fig. II.

The angular relations between the currents in a polyphase circuit may be shown to an audience if the necessary number of mirrors is employed. The reaction of condenser and impendance coil upon each other in a circuit adjusted for resonance may be illustrated if a high voltage condenser of large capacity is available, and the phase relations between the primary and secondary voltage and current of a transformer may be demonstrated.

Shadowgram or Silhouette Slides for the Optical Lantern.—No. V.

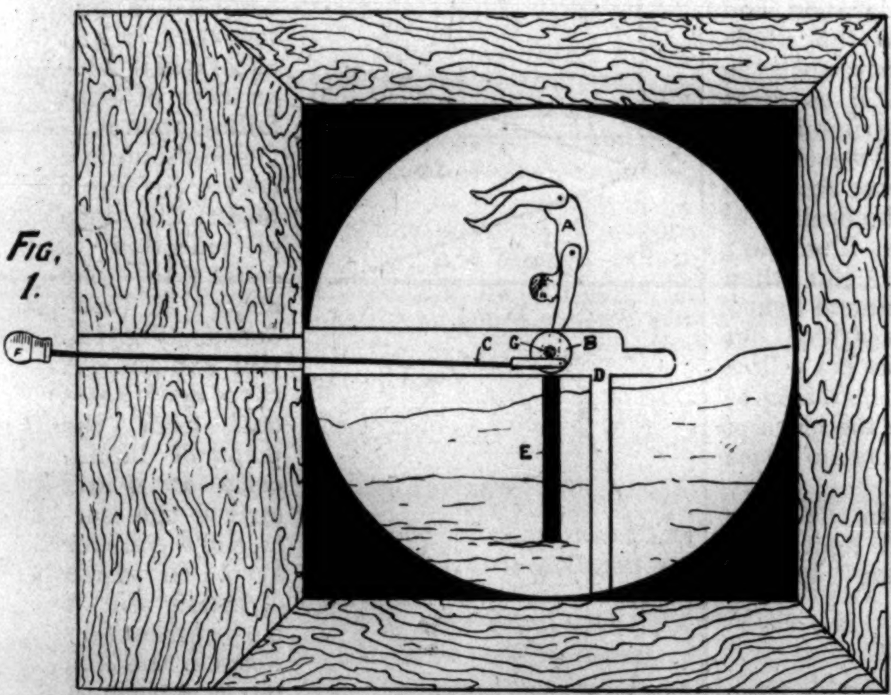
By **THEODORE BROWN.**

THE ATHLETE.

THIS slide consists of a figure of an athlete going through a course of gymnastic exercises on parallel bars, the action of the figure being wholly controlled by a wire rod C, shown in Fig. I.

The principle of this construction enables the operator to give complete revolutions to a small crank or wheel B; the figure actuated being fixed to the centre spindle G in such a position as to act as a weight or lever to counterbalance the said wheel B, thus preventing the wire rod C from resting in any position which would cause a dead centre.

FIG. 1.



The figure of the man A is made of thin zinc, and the moving parts are pivoted together in the manner shown in Figs. I. and II. The reader will have noticed that the man is provided with one arm only; in fact only one is necessary, as the shadowgram on the screen will indicate a second arm coming exactly opposite the first, and therefore not visible to the audience.

The wire rod C is loosely pivoted to the wheel B, so that there may be practically no friction in action. The centre spindle G must not project beyond the surface of the wheel B, otherwise the wire rod C will be hindered in its complete revolution. The bearing of the spindle G is in a hole made in the wooden support D, which is really a portion of the parallel bars, on which the athlete is supposed to be performing.

A sham support E is painted on the glass with some opaque medium, together with a few lines to represent the ground and surrounding scenery. By comparing the two diagrams, Figs. I. and II., the reader should experience no difficulty in the construction of this novel slide, but he must exercise the greatest care in fixing the arm of the figure in its proper position, as herein lies the secret of ultimate success.

The illustration Fig. I. shows the complete slide with a mask inserted, but the reader can of course use his own discretion as to employing a mask or not. The wire rod C is shown with a small handle F attached at the end, this may be substituted with a crook instead if thought desirable.

Other additions may suggest themselves to the reader. He may feel disposed to make the figure of the man with pivoted joints at the knees and elbow, and he may add two or more figures standing in the background as spectators, but in any case he must be careful to follow out the principle of the working parts, otherwise he may find some difficulty in getting the slide to work satisfactorily in every respect.

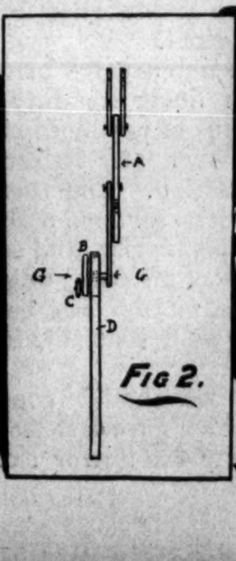


FIG 2.

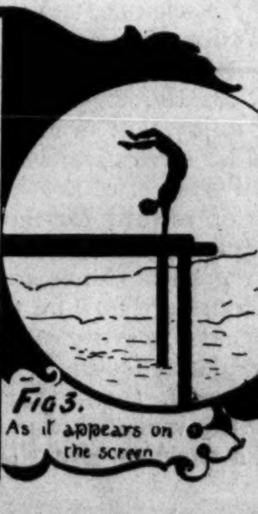


FIG 3.
As it appears on the screen

Physics for Lanternists.—No. III.

By F. J. SCRIMGEOUR.

THE physical laws of reflection do not play so important a part in lanternism now as they did some years ago. As the popularity of limelight increased, our interest in reflectors declined, and the modern operator, who only very occasionally descends from his powerful mixed jet to the more modest blow-through, knows nothing of the serious care and attention which were given by his predecessor to the reflecting surface of his magic lantern. In those old days the shining plate of silver placed behind the wicks of the oil lamp was approached with an earnestness not far removed from devotion, and some lanternists seemed to place the whole responsibility of a good or bad show upon the condition of this reflecting disc. If as great attention had been paid to the trimming of the wicks, the quality of the oil, and the cleanliness of the optical system as was bestowed upon that hallowed silver circle, the decline of the popularity of oil as a lantern illuminant would have been much less rapid. But when the brilliant beams of the "Drummond light"—as limelight was first called—sparkled out and made the clear old oil lamp hide his yellow face in very shame, the reflector had also to turn her face to the wall, for with the block of lime to intercept the rays there was no place left for her.

And so the years went on, and in the blaze and brightness of our oxyhydrogen light, with all its costly accessories, "reflector" became merely the name of an **antiquarian curiosity** of the lantern world; an old yet interesting piece of apparatus probably to be found in some country museums, ticketed and labelled for the information of summer visitors.

Nevertheless, in a quiet unobtrusive manner, it has all the time been doing its duty and giving enjoyment to millions of people in places and under circumstances when any light other than oil was out of the question. And then, as a sort of reward for modest service, perhaps, acetylene made a bid for popularity, and seems to have got it. Generators of all sizes, weights, and colours are now on the market, and behind the burners, in every case, we find our old friend the circular reflector.

It is well, then, that we should consider shortly the various laws which govern reflection, and in a word or two the plane mirror can be dismissed, for with it we, as lanternists, have little connection.

It is the simplest form of reflecting surface, and when perfect, it should neither absorb nor radiate the rays of light which fall upon it. A dull white surface will radiate light, but will not absorb it; a black surface will absorb light but will not radiate it; a coloured surface will partly absorb and partly radiate, but a polished surface will neither absorb nor radiate, it will reflect, and reflect only.

Fig IX

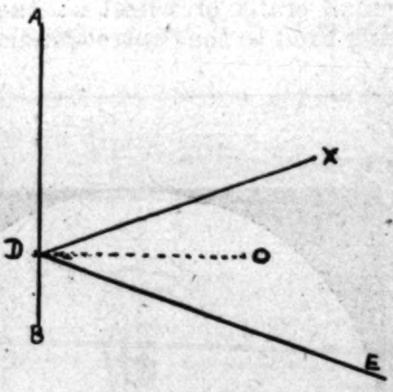
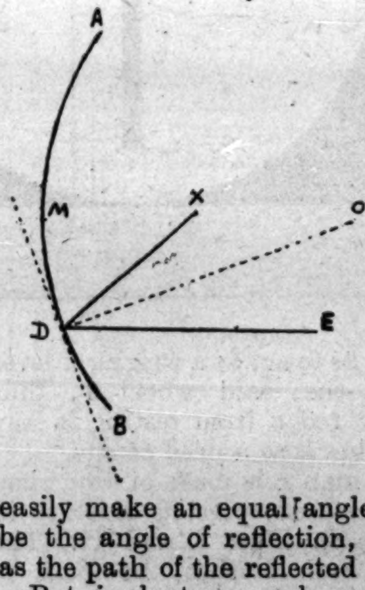


Fig X



Well, suppose we have a perfectly flat piece of metal polished until it might take the place of my lady's hand mirror, what effect will it have on rays of light falling upon it?

One simple law covers the whole result. The angle of reflection is equal to the angle of incidence. Fig. IX. will explain. A ray of light passes out from the point of luminosity at X and strikes the surface of the mirror at D. In which direction will it be reflected? From D the line D O is drawn at right angles to A B, and then, with the angle, X D O, known—the angle of incidence—we can easily make an equal angle, O D E, which will be the angle of reflection, and will give D E as the path of the reflected beam of light.

But in lantern work we do not use plane surfaces to reflect, and the diagram quickly shows us why; for we have no desire to examine, as with a search-light, the hinges of the side doors, or to throw an illuminating beam upon the lantern chimney. We do not wish to disperse the reflected light in this manner, but rather to force as much as possible to pass through the condenser. Therefore, we have resource to a spherical surface. In form it is as if we had cut a slice from a hollow ball of metal, and its chief feature is that every spot on its concave surface is at an equal distance from the imaginary point, which was the centre of the ball from which it was cut. It is difficult to represent this pattern of reflector in diagrammatic form, and it must be remembered that Fig. X. merely shows a section, which, however, is equally true, whether considered as vertical or horizontal.

In applying the great law of the angles of incidence and reflection to the concave surface, we are at once confronted with a difficulty. However are we going to get the equivalent of the line D O in Fig. IX.? Well, certainly we cannot draw a perpendicular line to the circumference of a circle, but we can to the tangent of a circle drawn at any point. Suppose that O is the centre of the circle of which A B is part of the circumference, the point of light is placed, let us say, at X, and one of the rays of light strikes the reflector at D.

Where does it go now? If we connect O to D, then O D will be a radius, and must, of course, be the perpendicular line to a tangent drawn at D. The angle X D O will be the angle of incidence, and by making an equal angle O D E—the angle of reflection—D E will show the direction of the reflected ray.

Thus, if we place the point of light at O, the rays of light will strike the

reflecting surface

and will fly back by exactly the same causes as they went, and so return to the luminous spot from which they sprung.

By placing the point of light about half way between O and the circumference, a beam of light, of which the rays are more or less parallel to each other, is thrown out by the reflector, and therefore we choose this position for our source of light. But after all is said, this consideration of the theory of reflection, although interesting, is not of much practical importance to us with our four-wick lamps and our acetylene flames, for our source of light is not the ideal luminous point. Instead of that, we have to deal with large sources of illumination which are composed of innumerable "points," and consequently when one point is in the exact position, which theory says is the best, then all the other points are "out of order." What are we to do?

"Experiment"—yes, that is the answer; we must try the various positions in which the reflector and the light can be put until we find the relative position in which the best effect is produced. Having got it, keep it.

In most acetylene burners the position of the flame is generally a fixture, and it will be noticed that it is placed somewhere between O and M. (Fig. X.)

Now a few words about the surface; keep it bright. The means is unimportant as long as the result is satisfactory. "How often should it be polished" is a question I am sometimes asked. "Every time the lantern is in use," I always say; and I don't think that is too often. The optical system should be cleaned every night, and at the same time the reflector should get a rub.

Besides the additional efficiency gained, do you know the great increase of pleasure there is in working a lantern newly cleaned? It is astonishing how much increase there is for a little labour.

The Dark-room Window with a Modification.

By **EDWARD DUNMORE.**

AN indispensable adjunct to the satisfactory pursuit of photography is having a thoroughly reliable method of illumination, one with the maximum quantity of light and the minimum of actinism. Owing to the imperfect filtration of the light, or I should perhaps say to the light filter used, it has become the usual plan to have a very small quantity of deep ruby light that not only puts a dangerous strain on the eyesight, as well as much inconvenience in conducting the ordinary work of the dark-room, instead of a fair amount that will permit everything to be comfortably seen. If the light is safe a little increase in the quantity of it can make no difference, but we all know that no light can be termed absolutely so. On this account the less there is of any kind the better for the work; here comes another but, but we can have a much larger amount of some light than others, although in small quantities either might be deemed safe. A screen may be so deep in colour that to ordinary eyesight little or no light appears to pass through it, and yet will have considerable effect on the sensitive plate, when a much more brilliant illuminant may be almost destitute of actinic effect. It is under such conditions we can see what we are about, and perform the different duties of the dark-room with ease and satisfaction.

It is very usual in the construction of dark-room windows to have separate sliding frames, each glazed with a different coloured glass, so that any single one can be used at pleasure. Of late years our plates have so increased in sensitiveness that one seldom finds development being conducted by any but those of the deepest ruby tint, with the result that time development has in some measure taken the place of development by observation, in order that the eyes may be spared the undoubted strain put upon them. Of course, exposure may be so accurately timed that a certain known length of time in the developer may produce the best results. Practically this accuracy is in the majority of cases unobtainable, and it is only when numbers of negatives under the same conditions of light and exposure are taken that the best results can be had or expected with time development; but when varied and unknown exposure have to be dealt with the close examination of the plate during the process is quite necessary to obtain the best results. By carefully noting the gradual formation of the image, many inaccurately timed plates may be made into good negatives that would be inevitably spoiled if time development had been adopted.

To see what we are doing safely it is of the utmost importance that the light is good, and the tiny square of deep ruby light will certainly not conform to the requirement unless the operator is possessed of abnormally good eyesight, which runs the risk of being injured by such continual strain. In the fitting up of the dark-room the glass should be

properly tested,

not only by the spectroscope but by the exposure of partially covered plates for some little time to its action, at least several times in excess of that used in ordinary cases of development. An ordinary pocket spectroscope is a most useful instrument, and in case of coloured tissues being used instead of glass, alteration of colour and fading by exposure to the light may be detected although it has escaped the notice of unassisted eyesight. As the makers now turn out plates more sensitive every year, it is quite necessary to be on our guard, as a safe light at one period may be unsafe at another.

In the old wet plate day a fold or two of yellow calico, and faded at that, answered every purpose, but now other conditions prevail, and from time to time the light requires testing to be quite sure of its suitability. Diffused light is more pleasant to most people to work by than that directly transmitted by ordinary orange and ruby glass. The addition of a cover of tissue or tracing paper will afford the desired modification without perceptibly reducing the light. It is well known that many deep coloured ruby glasses are more unsafe than lighter ones, and the use of such may lead to disappointment by fogging plates of which the cause is quite unsuspected, and the fault being attributed to either plates, developers, or extraneous light. If the precautions I have recommended are taken this of course will not occur. As to the position of the window, I prefer it on a level with the

developing table

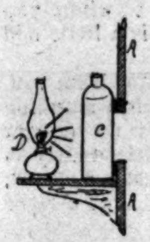
or sink, and not as I have frequently seen it high up in the wall, so that negatives had to be raised above the head to see through them, with the nuisance of the solutions running down the hands and the general awkwardness of the position. The idea that should regulate the position of the window is that as much safe light as possible should fall on the work and little as possible on the eyes of the operator. To facilitate these conditions a hinged shutter over the inside of the window that can be raised and lowered at will is an excellent plan. When developing this shutter can be lowered just below the level of the eyes without in any degree preventing the light falling on the work, which in fact seems to be somewhat augmented, on the same principle as when the lens is shaded in outdoor work. I think anyone who has once adopted this plan would be loath to relinquish it, the comfort in working is so much enhanced.

The position or aspect of the window, if daylight is used, is of importance; no direct sunlight should fall on it. If a north aspect cannot be secured an outside shade should be fixed, and only reflected light be permitted to fall on the window itself. In addition to the coloured glass or tissue, an opaque blind should be available so that the whole of the dark-room shall be put into absolute darkness at will. When plates are being dried after backing or orthochromatising, and set in racks or against the wall to dry, absolute darkness is essential to keep the plates from injury. A plan suggested for the construction of the dark-room window is the use of certain solutions suitably coloured, contained in tanks through which the light passes. The following light filter of this kind will be found excellent: Procure a square white glass quart bottle, painting over with black varnish or some opaque colour the two opposite sides, the bottom and the top as far as the shoulder, so that it is opaque in all directions except one; pasting black or brown paper over it answers the same end. Fill the bottle with a 10 per cent. solution of disulphate of quinine, made rather strongly acid with dilute sulphuric acid, and to which a little tincture of turmeric has been added sufficient to make it a bright canary yellow, and filtered; then fix the bottle behind a screen in which an opening has been made somewhat less than the width and height of the bottle. The light, either daylight or artificial, is arranged to shine through the solution, all other light being cut off, and we get a very brilliant yet

non-actinic light,

comfortable to work by and safer for the plates; in fact, but little inferior to daylight.

The following diagram will explain. A, board with aperture; B, bracket for bottle and lamp; C, bottle with solution of quinine and turmeric. The bottle must be placed quite close to the opening in the board, which should be padded round to ensure close contact.



The light resisting power of the solution of quinine may be tested by half filling a flat four-ounce bottle with it, placing a strip of bromide paper behind so that the light will pass through the solution to one part of the paper and through the empty portion of the bottle to the other, exposing to a good light, say an incandescent burner, for a few minutes and then developing. Although the light passing through the solution appears more brilliant than that through the empty spaces, it will be found to have little or no effect on the paper, whereas, that through the empty space will be black as soon as the developer is brushed on it. Of course care must be taken that the passage of the light is confined to that passing through the solution by shielding the rest part of the bottle, except that immediately above, from any adventitious rays.

With this tank arrangement it is quite as easy and comfortable to work as by ordinary daylight, and a vast advance over the ruby gloom so generally adopted. In all cases where artificial is used the source of light should be outside the dark-room. Only those who have worked continuously close to a lantern in the room can appreciate the discomfort caused by the heat, which with a large lantern and burner is considerable, giving rise to headaches and giddiness, quite avoided by having the light outside.

DIRECTIONS FOR TAKING PHOTOGRAPHS IN NATURAL COLOURS.

Communicated by Professor Lippman to the "Societe Francaise de Photographie," and Translated by Fuerst Brothers.

Dissolve 4 grammes of gelatine in 100 grammes of water, add 0.53 grammes bromide of potassium. For orthochromatising add about 6 cc/m of alcoholic cyanide solution 1.500, and 3 cc/m of alcoholic solution quinol in red 1.500.

After having mixed the above ingredients and reduced the compound to a temperature below 40 deg. Cent., add, in a dark-room, 6.75 grammes dry powdered nitrate of silver and stir for a minute or two until dissolved. Filter through glass-wool. Pour it over the glass plates which have been warmed in the same way as collodion.

Let the plates cool on a flat slab of very cold marble, wet each plate with alcohol before washing, then wash for half-an-hour, drain and dry. The plates are then ready and can be kept for a long time.

Before use moisten the sensitive emulsion with the following solution:—

Alcohol, absolute	100 grammes
Nitrate of silver	0.5 ,,
Acetic acid, glacial	0.5 ,,

Shake and dry. The plate thus manipulated increases its sensitiveness, but must be used the same day. Expose for about two minutes in sunlight before a Zeiss 6.3 lens.

Development.

Any developer may be used, amidol, eikonogen, etc. Perhaps the best effect is obtained by M. M. Lumiere's developer:—

I.	Water	100 grammes
	Pyrogallic acid	1 ,,
II.	Water	100 ,,
	Bromide of potassium ..	10 ,,
III.	Caustic ammonia	
	Density 0·960	

For developing take:—

Solution I.	10 grammes
Solution II.	15 ,,
Solution III.	5 ,,
Water	70 ,,

It seems to be more advantageous to develop little and to intensify with bi-chloride of mercury and with amidol.

One can also develop very well with a dilute solution of ammoniacal protochloride of copper. For fixing after intensification use cyanide of potassium.

PATENT INTELLIGENCE.

The following List, relating to current Patent Applications, is compiled expressly for the "Optical Magic Lantern Journal" by W. P. Thompson & Co., Patent Agents, of 322, High Holborn, London, W.C., to whom all enquiries for further information should be addressed.

No. Recent Patent Applications.

5605. 15th March, 1899. John McKinlay. Acetylene gas generator.

5655. 15th March, 1899. Charles Raleigh. Improvements in apparatus for use in the production of animated pictures.

5685. 16th March, 1899. Henry Irvine Whitty. An improvement in arc lamps especially for cinematograph and other projection applications.

5867. 17th March, 1899. Henry Talbot. Improvements relating to lanterns for incandescent gas lighting

5956. 18th March, 1899. Emanuel Block. Improvements relating to the production of changing or transformation pictures. Complete.

6202. 22nd March, 1899. Frederick Marshall Lee and Edward Raymond Turner. Means for taking and exhibiting cinematographic pictures.

6327. 23rd March, 1899. Ladislaus Emanuel Granichstädten. Improved means and apparatus for exposing photographic and like views cinematographically.

6350. 23rd March, 1999. Alfred Watkins. An improvement in apparatus for taking, printing, and exhibiting photographs.

6793. 29th March, 1899. William Kennedy-Laurie Dickson. Improvements in moving picture or consecutive view apparatus. Complete.

6794. 29th March, 1899. William Kennedy-Laurie Dickson. Improvements in apparatus for taking stereoscopic photographs and for exhibiting the same. Complete.

7278. 6th April, 1899. Henry Howse. Improvements in or connected with instruments for taking and displaying rapidly changing pictures.

7539. 11th April, 1899. George Arbuthnot Moore. Improvements in or connected with acetylene gas lamps.

7655. 11th April, 1899. Louise Joseph Emmanuel Colardean and Jules Richard. Improvements in automatic apparatus for successively presenting to view photographic pictures or slides in stereoscopes, optical lanterns, and the like. (Date applied for under Patents, etc., Act. 1883, Sec. 103, 21st January, being date of application in France.)

7682. 12th April, 1899. Ernst Walke. Improvements in picture blocks for producing animated pictures by rapidly turning over the leaves.

7881. 14th April, 1899. Horace Groves Sadgrove and James Hall-Wright. Improvements in or relating to cinematograph cameras.

SPECIFICATIONS PUBLISHED.

Copies of the following specifications may be obtained by remitting 1/- for each specification to W. P. Thompson & Co., Patent Agents, 322, High Holborn, London, W.C.

27618 of 1898. Schmitt. Acetylene gas lamps.

8512 of 1898. Rudolph. Anamorphotic lens systems.

10047 of 1898. Moy and Harrison. Apparatus used in displaying pictures upon transparent films.

2351 of 1898. Dunn Taylor and Phillips. Cart, hand, and other such lamps and lanterns.

9330 of 1898. Belfield (Westinghouse Electric and Manufacturing Company). Controllers for electric motors.

Notes and Queries.

A.B.W.—(1) In the first place, we should consider that the particular dealer who advised you knew very little about the subject. Your condenser is rather too small in diameter, and rather short in focus for your long focus lenses, hence the cause of which you complain. (2) The Herschel form of condenser is much used. Dallmeyer & Company, Limited, make an improved adaptation of this pattern, the lens next the objective being "crossed."

H.H.—See article in this issue.

Y. Groves.—The difference in price between the two regulators is correct. In our early numbers we gave several illustrated articles headed "Inside a regulator," a glance over these will explain the difference in price.

Garth.—Yes, a good light can be obtained with the jet; you are evidently keeping too much hydrogen on. Also try the lime a little closer.

Arfon.—We do not quite grasp your meaning. Have you no means for controlling the gas between the dissolver and the jet? The jets should have taps of their own.

G. Poole.—We have never seen the man to whom you refer, but have often heard from him. He is a little odd to say the least.

Pol.—We did not receive any previous letter from you, that dated April 13th being the only one. After standing the length of time you speak of there is no danger whatever, the danger is in using them promiscuously at short intervals. Paint a part of it black instead of red, and get a connector, otherwise you will find that a right and a left hand screw will not unite.

Photophilus.—See article in December, 1897, journal, entitled "An opaque yet folding screen."

Transfers.—Transfers for slides may be obtained from Theobald & Company, of Hounslow.

Magi.—We understand that Noakes & Norman, of Greenwich, or G. G. Platt, Birkbeck Road, Dalston, N.E., supply parts of lanterns.

R. P.—Keep oil of any kind away from your cylinder valve; explosions have been caused by acting in the manner you suggest.

Cylinder.—(1) Stand the hydrogen cylinder, valve end downwards for a few hours, then open valve, when the pressure of the gas may cause more of the "dark substance" to escape. (2) When next sending the cylinder to be filled, give instructions for it to be "burned out"; this will, for a time at least, prevent the discolouration of the limes.

J. Fisher.—There is no reason why limes hermetically sealed in glass tubes should burst, if everything is perfectly dry at the time of sealing up. Some firms have been known to send batches of turned limes to a glass blower, where they are allowed to stand about until convenient to place them in the glass tubes. Meantime they absorb moisture, and after a time expand and burst the tubes. Nothing but great care will answer in connection with so putting up limes.

J. S.—There is no such firm in this country; possibly there may be in your own (America); if so, better communicate with a photographic paper there. We fear, however, that you have no remedy.